AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A droplet discharging apparatus comprising:

means for discharging a discharge liquid in the form of droplets through an aperture by mechanically deforming a piezoelectric element by a normal drive signal;

a drive integrated circuit disposed adjacent to and in thermal contact with the piezoelectric element;

a control unit that selects between the normal drive signal and a cooling drive signal and supplies the selected normal drive signal or cooling drive signal to the drive integrated circuit, the normal drive signal including a waveform having a steeper rising slope, a steeper falling slope, and a shorter holding time than the cooling drive signal;

a substrate attached to and in thermal contact with the piezoelectric element and the drive integrated circuit;

a diaphragm disposed adjacent to and in thermal contact with the piezoelectric element; and

a temperature sensor associated with the drive integrated circuit for sensing a temperature of the drive integrated circuit;

wherein the sensed temperature of the drive integrated circuit reflects an operating heat of the piezoelectric element due to the piezoelectric element being thermally coupled to the drive integrated circuit via the substrate;

wherein the sensed temperature of the drive integrated circuit reflects the temperature of the discharge liquid due to the thermal connection of the discharge liquid, the diaphragm, the piezoelectric element, the substrate, and the drive integrated circuit;

wherein the control unit selects between the normal drive signal and the cooling drive signal based on the temperature of the discharge liquid;

wherein the droplets are discharged from the aperture based on the selected normal drive signal or cooling drive signal; and

wherein a flushing process is implemented between cycles of normal discharge to set the temperature of the discharge liquid to a predetermined temperature, the flushing process including selecting the cooling drive signal following ~~each period~~periods of normal discharge to set the temperature of the discharge liquid to a predetermined temperature prior to initiating a subsequent normal discharge.

2. (Previously Presented) The droplet discharging apparatus according to Claim 1, wherein the droplets are discharged for a plurality of times by the cooling drive signal so as to cool the discharge liquid to the predetermined temperature.

3. (Original) The droplet discharging apparatus according to Claim 1, wherein the cooling drive signal is set to a low frequency level that does not cause the piezoelectric element to heat the discharge liquid.

4. (Original) The droplet discharging apparatus according Claim 1, wherein the cooling drive signal has a waveform shape set so as to cause droplets of a maximum weight to be discharged.

5. (Original) The droplet discharging apparatus according to Claim 1, wherein if the temperature of the discharge liquid detected by a temperature detecting means exceeds a predetermined threshold temperature, then the droplets are discharged from the aperture by the cooling drive signal.

6. (Original) The droplet discharging apparatus according to Claim 1, wherein if the number of discharges within a predetermined time performed in response to the normal drive signal exceeds a predetermined threshold number of times, then the droplets are discharged from the aperture by the cooling drive signal.

7. (Cancelled)

8. (Original) The droplet discharging apparatus according to Claim 1, wherein the discharge liquid is a printing ink.

9. (Original) The droplet discharging apparatus according to Claim 1, wherein the discharge liquid is an electrically conductive material for forming a wiring pattern.

10. (Original) The droplet discharging apparatus according to Claim 1, wherein the discharge liquid is a transparent resin for forming a microlens.

11. (Original) The droplet discharging apparatus according to Claim 1, wherein the discharge liquid is a resin for forming a color layer of a color filter.

12. (Original) The droplet discharging apparatus according to Claim 1, wherein the discharge liquid is an electro-optic material.

13. (Original) The droplet discharging apparatus according to Claim 12, wherein the electro-optic material is a fluorescent organic compound exhibiting electroluminescence.

14-15. (Cancelled)

16. (Currently Amended) A droplet discharging method comprising:

sensing a temperature of a drive integrated circuit disposed adjacent to and in thermal contact with a piezoelectric element;

determining a temperature of a discharge liquid disposed adjacent to the piezoelectric element based on the detected temperature of the drive integrated circuit;

selecting between a normal drive signal and a cooling drive signal based on the temperature of the discharge liquid;

discharging the discharge liquid in the form of droplets through an aperture by mechanically deforming the piezoelectric element based on the selected normal drive signal or cooling drive signal;

selecting the cooling drive signal during a flushing process following ~~each~~ periods of normal discharge of the discharge liquid;

discharging the discharge liquid by mechanically deforming the piezoelectric element based on the cooling drive signal during the flushing process to cool the discharge liquid prior to a subsequent normal discharge; and

selecting the normal drive signal following the flushing process;

wherein selecting the normal drive signal includes generating a waveform having a steeper rising slope, a steeper falling slope, and a shorter holding time than the cooling drive signal.

17. (Previously Presented) The droplet discharging method according to Claim 16, wherein the cooling drive signal is applied a predetermined number of times so as to cool the discharge liquid to a specified temperature.

18. (Previously Presented) The droplet discharging method according to Claim 16, wherein the cooling drive signal is set to a low frequency level that does not cause the piezoelectric element to heat the discharge liquid.

19. (Previously Presented) The droplet discharging method according to Claim 16, wherein the cooling drive signal causes droplets of a maximum weight to be discharged.

20. (Previously Presented) The droplet discharging method according to Claim 16, wherein if the temperature of the discharge liquid exceeds a predetermined threshold temperature, the cooling drive signal is selected.

21. (Previously Presented) The droplet discharging method according to Claim 16, wherein if the number of normal discharges within a predetermined time exceeds a predetermined threshold number of times, the cooling drive signal is selected.

22. (Original) The droplet discharging method according to Claim 16, wherein cooling discharge is carried out during the normal discharge.

23. (Original) The droplet discharging method according to Claim 16, wherein the discharge liquid is a printing ink.

24. (Original) The droplet discharging method according to Claim 16, wherein the discharge liquid is an electrically conductive material for forming a wiring pattern.

25. (Original) The droplet discharging method according to Claim 16, wherein the discharge liquid is a transparent resin for forming a microlens.

26. (Original) The droplet discharging method according to Claim 16, wherein the discharge liquid is a resin for forming a color layer of a color filter.

27. (Original) The droplet discharging method according to Claim 16, wherein the discharge liquid is an electro-optic material.

28. (Original) The droplet discharging method according to Claim 27, wherein the electro-optic material is a fluorescent organic compound exhibiting electroluminescence.

29-32. (Cancelled)

33. (Previously Presented) The droplet discharging apparatus according to Claim 1, wherein the diaphragm separates the piezoelectric element from the discharge liquid.

34. (Previously Presented) The droplet discharging apparatus according to Claim 1, wherein the piezoelectric element and drive integrated circuit are attached to the substrate by an adhesive.

35. (Previously Presented) The droplet discharging apparatus according to Claim 1, wherein the piezoelectric element and drive integrated circuit are attached to the substrate and are spaced apart from one another.

36. (Cancelled)

37. (New) The droplet discharging apparatus according to Claim 1, wherein the normal drive signal includes a frequency of approximately 20kHz and the cooling drive signal includes a frequency of approximately 10Hz.

38. (New) The droplet discharging apparatus according to Claim 1, further comprising a switching signal generator that selects between the normal drive signal and the cooling drive signal.

39. (New) The droplet discharging apparatus of Claim 1, wherein the normal drive signal is separate and distinct from the cooling drive signal.

40. (New) The droplet discharging method according to Claim 16, wherein selecting the normal drive signal includes generating a waveform having a frequency of approximately 20kHz and wherein selecting the cooling drive signal includes generating a waveform having a frequency of approximately 10Hz.

41. (New) The droplet discharging method according to Claim 16, wherein selecting between the normal drive signal and the cooling drive signal includes selecting between two separate and distinct signals.